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ABSTRACT

Intended for use by teachers, instructional designers, and educational administrators, this manual provides guidelines for producing education programs for Telidon, a Canadian videotex system. An introductory chapter describes the manual's goals and intended audience, outlines cautions to be considered when writing for Telidon, and lists the names of persons experimenting with Telidon's educational potential. The second chapter provides definitions for "telematics," "videotex," "teletext," and "viewdata"; lists the basic characteristics and uses of videotex; and describes how Telidon works. Page creation principles used to create one screenful of Telidon information are outlined in the third chapter which defines "page" and "program" as related to videotex; lists and discusses basic components of an effective Telidon graphic, Telidon page components, and types of Telidon pages; describes the Telidon grid; lists and discusses seven steps in copywriting and text layout; and summarizes seven basic Telidon design principles related to type style, borders, color, highlighting, the blink function, order of display, and textures. The fourth chapter provides an instructional development context within which the user can develop Telidon programs, including a model for instructional development with Telidon and a case study which illustrates a detailed series of program design tasks. A six-item bibliography is provided. (ESR)

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HOW TO WRITE EDUCATIONAL PROGRAMS FOR TELIDON

A SELF INSTRUCTIONAL MANUAL

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c. 1982

IR011122

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These materials are intended to provide a basic authoring manual for teachers and educators who are interested in exploring the potential of Telidon technology for education. In addition, the package should also be of interest to administrators, trainers, and students of educational media and technology, and anyone wishing to experiment with the educational potential of this new medium.

Additional copies of this publication may be obtained from the authors at the University of Manitoba.

GUIDE TO THIS MANUAL

ONE: GUIDE TO THIS MANUAL

This introductory section will explain what this self instructional manual is all about. Our basic intent is to provide you with a "short course" designed to orient you to the essential knowledge and skills required to develop educational materials for Telidon.

This first unit will examine five basic and crucial questions about the manual itself:

-- What is this manual about?
-- What are the goals of this manual?
-- What do we know about you and what should you know about us?
-- What cautions are there in writing for Telidon?
-- Who else, locally, nationally, and internationally is experimenting wi h videotex and its educational potential?

What is this manual about?

In a word, Telidon. More generally, videotex. These new technologies have come about over the past decade through a marriage of television, telecommunications, and the computer technologies. Videotex is described by Roger Woolfe (1980) as

> A worldwide phenomenon which is going to affect everyone's business and domestic lives. Inexpensive and easy to use, (it has) a potential to bring electronic information services into homes and businesses at prices which the mass market can afford to pay.

David Godfrey (1981) describes Telidon as a Canadian videotex system:

> Telidon is essentially a way of creating pictures so that computers in a central location can communicate with TV terminals in the home or office. As one of the fastest growing technologies in North America, its impact on government, industry and the public imagination has already been enormous.

Significantly perhaps, neither of the above writers notes any specific educational potential for videotex and Telidon, unless one assumes that education will move from the school into the "home" and "office" arenas. The manual you are now reading, by contrast, places high priority on the educational implications of videotex.

What are the goals of this manual?

Our goals are threefold. First, we intend to examine what Telidon is, how it works, and what its potential role in education might be. This will make up the basic content of the second chapter.

Second, we will show you how to write for Telidon; how to write pages, and how to write programs. Chapter 3 focuses upon page creation, while Chapter 4 examines the broader view of program design. It might be noted here that "program" in the CAI or programmed instruction sense is not a commonly used term in conjunction with videotex materials. The videotex market is information, not instruction. Nevertheless, we advisedly introduce the term "program" to be used in its traditional instructional sense, as a sequence of frames with a didactic purpose.

Our third aim is purely experimental in nature. We wish to explore this new technology, to probe its educational potential, and to question its uses in the home classroom and the school classroom for teaching and learning in the 80's and beyond. At this stage Telidon is new. We are not completely certain where it is headed, educationally speaking, so we wish to attempt in the process of experimentation, to "tease out" its unique attributes as well as any potentially negative effects.

What do we know about you and what should you know about us?

Well, we have assumed that you are either teacher, or instructional designer, or administrator. We hope that you would also classify yourself as an innovator, an experimentor, and possibly a decision maker. We have been requested to develop this manual for the Manitoba Department of Education, so we assume that most of you are probably Manitobans, though we realize that our manual will be useful elsewhere. We also assume that you have an interest in teaching through technology in general, and that you wish to explore specifically the utilization of Telidon technology within your subject matter specialty.

Most important, whoever you are, we assume that you have a curiosity, desire, and open mindedness to experiment with Telidon.

On the other side, what should you know about us? We are a team of individuals with differing skills and backgrounds who have been involved in various ways with early Telidon activities in Manitoba. The first author is an associate professor of educational technology at the University of Manitoba interested in educational uses of Telidon; the second author is directly involved in preparing Telidon materials for INFOMART in Toronto; while the third listed author has explored Telidon from his perspective as an assistant professor within the Continuing Education Division of the University of Manitoba.

What cautions are there in writing for Telidon?

There are indeed some cautionary notes which need to be stated at the very outset. First, Telidon at this writing is NOT readily accessible to all schools and all homes in Manitoba. We are told that such will be the way of the future, but we don't know for sure. We are not even completely sure whether the microcomputer, the videodisc, the electronic game boom, and home satellite television are competing or complimentary services of the future wired society. What we do know right now, is that if you write a Telidon lesson, it can be formally used in very few locations within the province. At this writing only one or two schools are able to use your Telidon program immediately. So:

> CAUTION #1: Your programs will have minimal immediate value for direct teaching and learning unless in your own classroom.

Second, writing for Telidon is a team affair. Teachers who are used to functioning as individuals may find it difficult to adapt to the rigors of the team environment. We are not sure at this juncture what the optimum team size and make-up might be, although we think that three might suffice: a content expert (that's you the teacher), an instructional technologist (someone like us with background in instructional design); and a page creator. We perceive this latter individual as having skills in the fine arts, especially in the domain of graphic arts and typography, as well as skill at inputting the pages into the Telidon data bases.

CAUTION #2: Writing for Telidon is not likely to be a one-person job, but rather a team effort.

Initially, you may have thought that you, the teacher, with a little newly acquired programmed instruction skills, would be the personal interface between your content and the ultimate Telidon pages. We think not. Indeed, although this manual will show you how to write for Telidon, you probably will never need to touch the computer hardware necessary for the final step. Rather, it is the person with that fine arts background who will do that, and indeed, the Department of Education has already arranged for such a person to be part of your team.

As an analogy, think of producing an educational film. Of course you might function as a one-person team, but not likely. Rather, your task will be to select the content, perhaps to write the treatment, and then a script. But a professional narrator will read for you, professional actors will act for you, and a professional photographer will shoot the necessary footage. Neither will you personally do the editing, the music composition, nor the final print development in the lab. All of these tasks are part of the total team effort that goes into a film production. Such is also the case with Telidon.

This leads us into a third caution concerning Telidon. The technology is changing so rapidly that there is a real danger of both hardware and software becoming out of date, almost as fast as we write this. The educator has the responsibility of finding out which Telidon software is in operation on the system where the pages are to be loaded. While some Telidon software is currently based upon rigid hierarchical tree structure, recent new software developments allow much greater flexibility in overall database

design and in how users access information. Be sure that you are aware of the software capabilities offered by your system. Enroll in an information workshop, or ask the database administrator or editorial staff to provide you with guidelines for the development of your application. You will most likely want to take full advantage of whatever flexibility and special features are offered by a particular hardware. In summary:

> CAUTION #3: Changes in software and hardware may rapidly outdate current practices. Find out what is available on your system.

Another related criticism of Telidon is that it is limited to a "tree structure" model to create and store pages; therefore, the model does not encourage "good pedagogy". It is an expensive system being used in simple linear fashion to do nothing more than turn pages.

On the other hand, it would seem that the role of the instructional development team is to experiment with a "new" medium for its potential contribution to education. If Telidon is limited in its programming options, then we must learn to work effectively within those limitations as well as to develop it further to meet our other needs.

Aesthetically speaking, limitations need not be disadvantages, but rather artistic parameters. As an analogy consider the classic drama. Its limitations include a five act structure, coupled with a physical stage on which to act out its plot. And yet, the challenge to the dramatist is, through print and action, to make you see, to make you feel, and to make you experience. Few dramatists have ever complained about being so limited; rather they have taken up the challenge of the medium.

Perhaps then, the art of Telidon is to be able to work within clear delimitations.

CAUTION #4: There may indeed by certain limitations to Telidon, but these are probably more usefully considered as constraints to work within.

One final thought. In designing Telidon applications and programs, many people appear to believe that the initial design and layout stages are relatively easy. Quite the contrary, good design is often very involved and time consuming. But the reward is a well thought out application that is both easy to read and easy to access.

Who else is experimenting with Telidon's educational potential?

If you are considering creating an educational program for Telidon you can be confident that you are not alone. A great deal of work is going on across Canada to open up the possibilities of utilizing Telidon for classroom-based or distance education. If you want to know more about what's going on in your area these are some of the contacts you should pursue:

Mr. David Godfrey, University of Victoria
Mr. Hans Kratz, Alberta Education
Mr. Walter Grey, Red River Community College
Mr. Fraser Taylor, Carlton University
Mr. Pierre Brassard, Societe de radio-television du Quebec (Montreal)
Ms. Betty MacDonald, Frontier College, Toronto
Mr. Roger Elmes, Association of Canadian Community Colleges (Toronto)

Roughly speaking educational research with Telidon can be broken into the following categories. A summary of current research should be available from the Canadian Videotex Consultative Committee by November, 1982. Types of activities include:

1. Field trial demonstration data bases
   - applications for specific user groups
2. Transmission experiments
3. Gateway facilitation (software and networks)
4. Network routing methods
5. Data base architecture
6. Page creation developmental work
7. Policy

Conclusion

Are you still with us? If you were searching for a quick way to teach your subject to your classroom tomorrow (literally, that is), then sorry, you are in the wrong place.

But, if you are still curious about Telidon and its potential to assist you, then turn the page and allow us to guide you through a fascinating glimpse into the possible future of education.

TWO: WHAT IS TELIDON?

This unit will provide a basic background for working with Telidon. Readers wishing to proceed systematically will find this chapter useful in examining basic videotex concepts. Others wishing to move directly into instructional design and page creation may wish to omit this unit and proceed directly to units three and four.

Objectives:

After completion of this unit, you should be able to

1. Define basic terminology: videotex, telematics, informatics, teletext, and viewdata.
2. State the basic characteristics and uses of videotex.
3. Describe how Telidon works.

Objective #1: Define basic terms: videotex, telematics, informatics, teletext, and viewdata.

> All modes of communication that have been devised by man are now coming together into a single, electronic-based computer driven system. The focus of this will be a Home Communications Set (an HCS) that, in addition to entertainment programming, will receive televised and printed news, as well as reference material from computerized libraries. Through its two-way capability, it will allow people to do their banking, take part in town meetings, and school hearings, send mail electronically, get emergency assistance by video telephone, do their shopping, and tie in to international communications. A whole new world of information is open to people. What should seem like 1984 is already state-of-the-art.
>
> John Wicklein (1980)
> The Electronic Nightmare.

Telematics and informatics are two interchangeable terms which are being used to describe the phenomenon identified above by Wicklein. Telematics (originally telematique) is a term coined in France to describe the interconnection between computer technology and telecommunications.

Videotex is a medium by which coded information is stored in digital form in a mainframe (host) computer and is transmitted via full screen video format to a conventional TV cathode ray tube (picture tube) or other monitor by voice grade telephone lines, co-axial cable or fibre optic lines. More simply, videotex is the name of a new kind of online information system which displays its output on a TV screen or other monitor.

Teletext refers to a one-way or non-interactive videotex system. It reaches the TV set through the air like a standard TV broadcast signal. Teletext uses either the vertical blanking interval or the standard full field video format for displaying the coded information. Teletext offers only a limited selection of information pages disseminated from the broadcast station. Using a keypad, a viewer can select one page at a time, as required.

Viewdata was the original name for the British videotex system now called Prestel. Since it could not be registered in the UK as a product name, it has been used in England to refer to the non-broadcast version of the technology. Today the term has been replaced in North America by the word videotex.

Videotext is sometimes used as a generic term for videotex and teletext systems. It is a source of confusion, however, since it is also a product name for a German teletext service, and is very similar in spelling to videotex. As a result, videotext has been dropped from most current discussions of the technology.

Examples: Figure 1 illustrates the variety of specific product names for various national videotex and teletext systems. Thus Teletel, Qube, Captain, and Telidon are all videotex systems, while CEEFAX, ORACLE, ANTIOPE, and CIBS represent some of the teletext systems currently operating.

THE VIDEOTEX FAMILY TREE

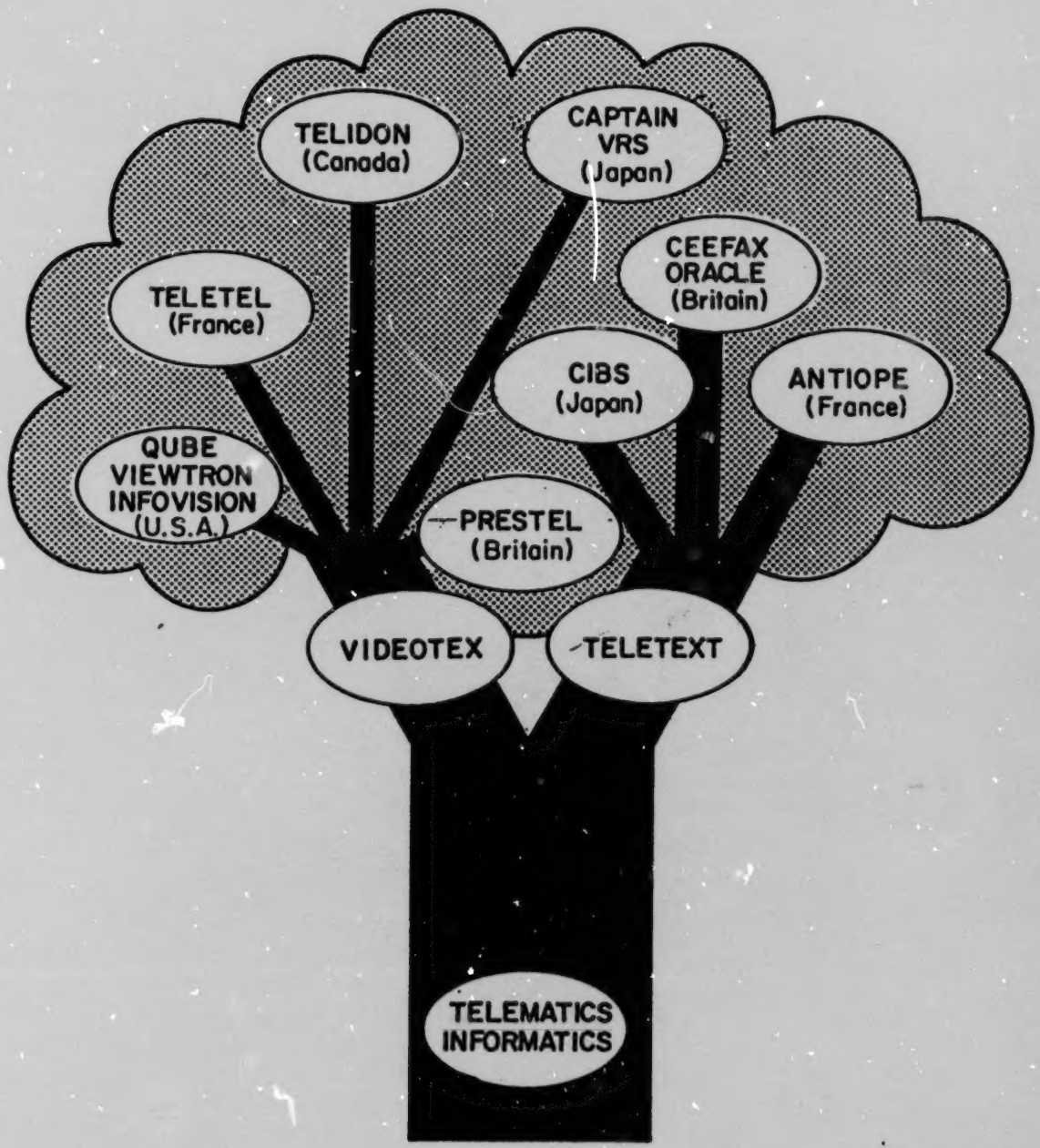


Figure 1 (Hurly and Hlynka, 1981:8)

Objective #2: What are the basic characteristics and uses of a videotex system?

Characteristics of videotex. The following list (modified slightly from Woolfe (1980) delineates the basic characteristics of a videotex system.

1. Videotex features still pages containing text and graphics in color. (Animation and audio are also possible, but add to the expense.)
2. Videotex can readily use adapted domestic TV sets as terminals, or any CRT monitor.
3. Videotex is easy to use, requiring only a keypad or keyboard for inputting.
4. Videotex has mass market appeal, rather than a specialist business appeal only.
5. Videotex cost is low compared with traditional on-line information retrieval services.

Uses of videotex. Videotex is generally perceived as an informational medium rather than an educational medium. We shall therefore examine general informational uses first, then focus on potential educational uses.

A. General videotex uses.
   1. Retrieval. This includes the collection, storage and dissemination of information; use of page turning techniques; and use of query approaches for information retrieval.
   2. Computing. Including wordprocessing, simulations, modeling, calculation applications and artificial intelligence.

3. Transactional. Teleshopping; telebanking.

4. Messaging. Electronic mail; facsimile transmission.

5. Downline loading. This allows microcomputers in the home (or office) to be loaded with a specific program, thus eliminating expensive on-line transactions, and allowing the user personal and private use of a given program.

B. Educational uses.

1. Interactive uses.

   i. Creative processes such as discovery learning, word processing, and computer art.

   ii. Cognitive reinforcement essential for computer assisted learning and computer managed learning.

   iii. Support for interactive distance communications via teletutoring and teleconferencing.

2. Information retrieval.

   Many uses in education range from bibliographic searches from data banks, to retrieval of specific pages of information on specific topics, to use of frames of visual materials to support a lecture (in essence an electronic transmission of color slides).

3. Dissemination of electronic information

   For example, administrative information such as curriculum information, class cancellations, job opportunities, etc.

4. Electronic publishing.

   This use provides an alternative to conventional print, and becomes especially relevant as costs of traditional printing escalate. This category includes publishing of electronic catalogs, bibliographies, and information services.

5. As a complement to traditional ETV.

Videotex can provide instant broadcast listings, program notes, teacher guides, discussion questions, and the already familiar captioning for the hearing impaired.

Comment:

Before concluding this section on the uses of videotex and Telidon, two general points need to be emphasized. First, we shall examine the difference between information and instruction; second, we shall point out that teaching via Telidon is significantly different from traditional classroom teaching. We now turn to a brief analysis of each of these in turn:

1. In programming for Telidon, the writer needs to keep in mind the distinctions between information and instruction. The difference is crucial because Telidon is primarily an information medium and not an instructional tool.

Information is data, raw and unprocessed. For example, the daily newspaper contains information: sports information, news information, advertising information, etc. The onus is on the user to select and use whatever information he or she needs. Some readers will look at the headlines, still others will read the comics, and some will want the sports pages. The locus of control is clearly with the user.

Instruction implies a different set of rules for communication. In instruction the locus of control shifts and the instructor takes the major responsibility in delivering pre-selected chunks of information. It is assumed that the instructor is expected to do more than deliver information to the student; he must also ensure that learning has taken place.

2. In using Telidon for educational purposes, it needs to be kept in mind that Telidon violates traditional concepts of teaching in one major respect. Traditional teaching implies a classroom relationship between one teacher and a group of students. Telidon implies a different set of student-teacher relationships. The learning is most likely learning at a distance; the learning is most likely student initiated; external motivation by teacher and peers may be less available; the teacher-student relationship may become solely an electronic one; and, the role of the teacher in the learning transaction will likely need to change to that of facilitator and tutor instead of information provider. An early step in using Telidon requires on the part of the writer a firm understanding that new student-teacher roles need to be explored. We most emphatically do not conceive of Telidon as solely a classroom audiovisual aid. Rather, Telidon has great potential as a home, library, or office study center.

Objective #3. Describe how Telidon works.

Telidon is quite unique as a product because it can be utilized in either teletext (broadcast) or videotex (viewdata or land line transmission) modes. Telidon is a software product. The software instructions which Telidon uses to direct the computer how to store and send Telidon-based data incorporates a new language called Picture Description Instructions (PDI). It is PDI's which have given Telidon a graphic capability superior to other systems. If you want to know more about how PDI's work you should obtain the following manual from the Federal Department of Communications:

H. G. Bown, C. D. O'Brien, W. Sawchuk and J. R. Storey. Picture Description Instructions (PDI) for the Telidon Videotex System. CRC Technical Note No. 699-E. Ottawa: Dept. of Communications, 1979.

A summary of the various formats for creating and storing videotex pages can be obtained from the article "Videotex - An Interactive Tool for Education and Training" by Paul Hurly, Denis Hlynka and Janet Hurly (see end of section for ordering instructions).

Examining Figure 2 you can see the various components of a Telidon system. By utilizing either a special dedicated NORPAK Information Provider System (IPS) page creation terminal or an adapted computer system (e.g. an Apple microcomputer with software or a VAX computer with a UNIX operating system and Telidon interface software from Athabasca University) a person creates the text and graphic images for storage in the mainframe computer.

In the teletext mode Telidon pages stored in computer memory are broadcast in a continuous repetitive cycle. Since the amount of time it takes for one page to be accessed is determined by the number of pages in the cycle, an average of 200 pages are broadcast at a time.

VIDEOTEX HARDWARE COMPONENTS

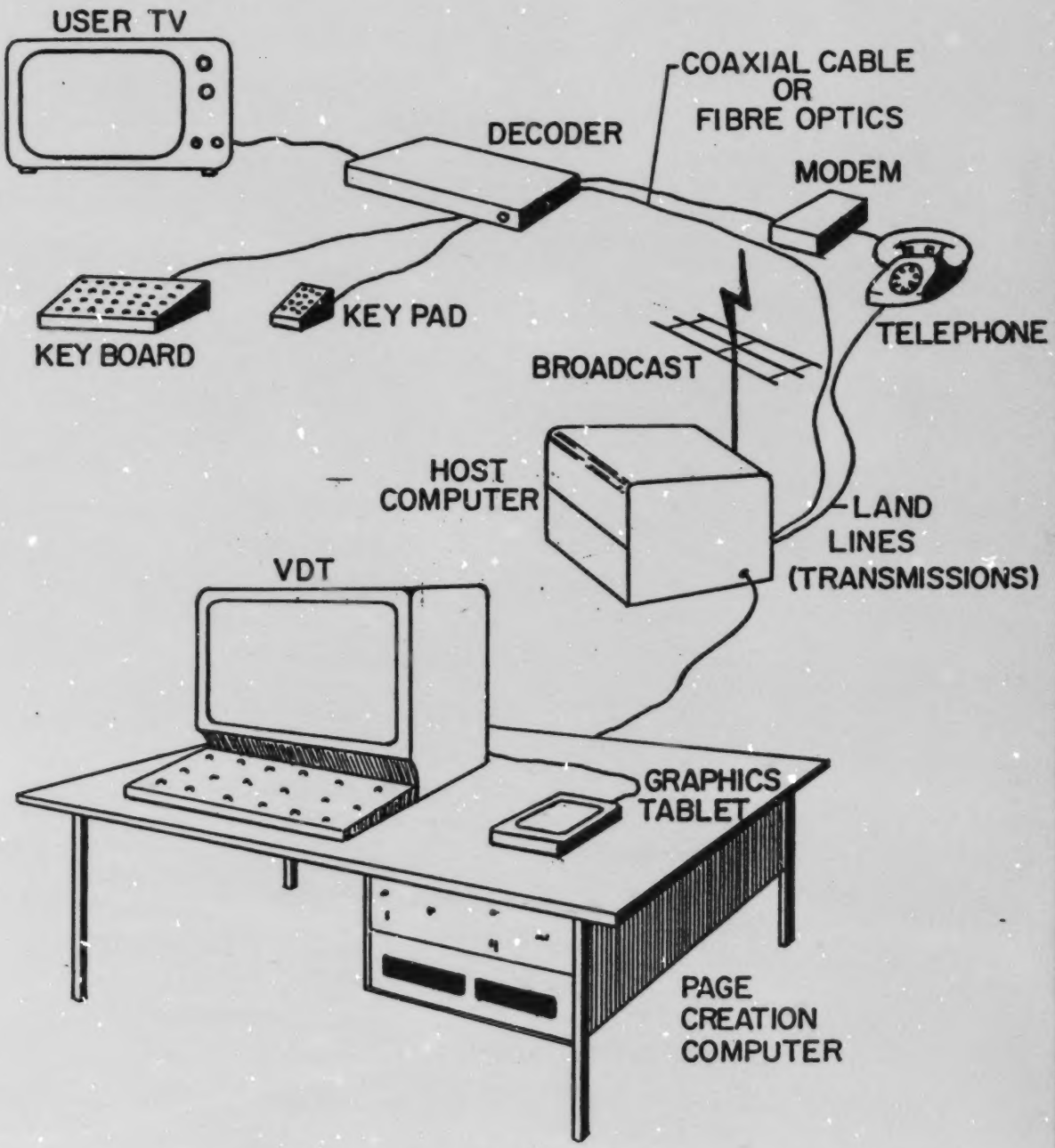


Figure 2

The broadcast mode is one-way. Users at home, or in an office, select the page they want by pressing in the page code on the key pad. The key pad is shaped like a hand-held calculator. The decoder on the modified TV set or monitor scans the broadcast signal until it finds a page with the address identical to the code chosen by the users. This page is then plucked from the broadcast cycle, is formated according to instructions contained in the decoder's microprocessor, and is projected onto the surface of the cathode ray tube (CRT) of the TV screen.

The videotex mode differs from teletex in that when the users request a specific page, that code is sent directly to the computer. Figure 2 shows that when a standard voice grade telephone line is in use a telephone and a modem (MOdulate/DEModulate) is required. This device translates the digital microprocessor/computer signal into analogue format for transmission. When the Canadian telephone utilities switch to digital telephony, the modem will no longer be required for this purpose. The modem also affects the speed of the transmission since voice conversations normally travel along the wires at speeds much slower than electronic data. When a regular telephone is used in videotex communication the data can leave the mainframe computer at speeds up to 9600 bits/second which must be slowed down by the modem at the users' end. If coaxial cable or fibre optics are employed the modem is not required.

The decoder is a crucial component of the system. Containing a microprocessor (computer on a chip), it receives the stream of computer data and assembles it into a human intelligable message. The Telidon system employs formating instructions which are embedded right into the receiving microprocessor. This has two advantages. First, messages from the computer to the receiver or user are shorter and thus faster because they don't have to contain all the instructions in detail. Second, with instructions

on how to shape, place colour, etc., each data image within the receiving decoder, the Telidon image, especially complex graphics, can be assembled and projected to the TV screen faster. It means that users have to wait less to view the information they want. This is important when users start inevitably to compare videotex systems to the speed and ease of operation of an office data processing or management information system.

WRITING FOR TELIDON: PAGES

THREE: WRITING FOR TELIDON: PAGES

Introduction

There are three basic elements involved in writing material for videotex. First, you must master the art of copy-writing; second, you will have to learn to write programs; and last, you will need to have the pages created and correctly stored for retrieval purposes. The aim of this unit is to focus solely on the first element mentioned above. Unit four will deal with programs. It is assumed that the actual task of page creation will be handled by an individual who may either be a typist or graphic artist by profession, capable of text and graphic page creation.

Objectives for this unit:

After working through this unit on page creation principles, you should be able to

1. Define the terms "page" and "program" as related to videotex.
2. List and discuss basic components of an effective Telidon graphic, Telidon page components, and types of Telidon pages.
3. Describe the Telidon grid.
4. List and discuss seven steps in copy-writing and text layout.
5. Summarize the seven basic Telidon design principles of type, borders, color, highlighting, the blink function, order of appearance, textures.
6. Write your own Telidon pages.

Objective #1: Define the terms "page" and "program" as related to videotex and Telidon.

Before we begin with instructions on effective copywriting for Telidon pages, we will offer the following definitions: A page is one screenful of Telidon information. It is precisely that information which appears on your television screen after a given page has been requested. A complete page requires a certain amount of time to display on the TV screen and does not appear instantaneously. Page display time depends upon many variables: the amount of text, the number and complexity of graphics, and the transmission speed (baud rate). The term "page" is used synonymously with the programmed instruction term "frame."

A program, which will be discussed more fully in the next section of this manual, is basically a sequence of pages related in some logical format or sequence. The term program, as it is used here, is not to be confused with "software programs". Rather, in the context of educational applications, we use the term program to refer to a "package" or "unit" or "instructional product."

Most Telidon systems rely upon a tree structure model, within which linear sequences, branches, and simple loop options are possible. However, as has been mentioned earlier, it is expected that Telidon will rapidly out-distance the tree structure model, thus the writer should not be too constrained within these limits, but rather find out which system is operating currently in his or her area.

Objective #2: List and discuss:

a) Basic components of an effective Telidon graphic

b) Telidon page components

c) Types of Telidon pages.

---

a) A good Telidon graphic has three basic components: a title, a visual, and a text. The title is placed near the top of the page (in a Telidon graphic) and should reflect clearly and precisely the content to follow. The text carries the major component of the message, although a visual may also be significant in this regard. Basic textual information may be presented in continuous prose, in a single paragraph, in a series of short paragraphs, or in a simple list. The key to effective graphic communication is brevity. The visual should provide specific support to the overall message to be communicated. That support may be cognitive, as in an accompanying graph or chart; or it may be affective, to provide an aesthetic feeling to complete the message content.

The above components, of course, are universal. With minor modifications, they apply equally well to posters, bulletin boards, commercial advertising billboards, and overhead transparencies. An effective graphic for Telidon is, very simply, an effective graphic.

Some Telidon pages, you will quickly discover, do not really require a visual. A visual with no apparent function has been appropriately labeled a "visible". It is there, but adds nothing cognitively or affectively to the impact of the message. On the other hand, it is equally possible for the novice writer to fall into the trap of developing Telidon pages which are all print, resulting in a program which is aesthetically dull.

Of course, it is quite appropriate in some circumstances to use only a visual, with no text, or a major visual with only a brief supporting text.

b) Page components. Before creating a page of content, convention requires certain basic information to appear on each page. Header information includes the information provider name (IP for short) and a page number. Header information usually appears across the top useable line (Line #2 is our recommendation.)

Routing information is placed across the bottom useable lines of the page and provides the user with information to continue or exist the program.

Whatever space is left may be used for text and graphic information. The figure below suggests one configuration of page components:

(row #1 left blank)
(row #2 INFORMATION PROVIDER NAME PAGE NUMBER
SERIES TITLE PAGE TITLE TEXT AND GRAPHIC INFORMATION
(r. 18 & 19) ROUTING INSTRUCTIONS
(row 20) left blank for machine feedback.

c) Types of Telidon Pages. Due to the nature of the tree structure of the Telidon architecture, four types of pages need to be identified so that the potential writer may consider their appropriate use.

Index pages or menu pages classify and group various components of information at the beginning of each sequence of information. In Telidon, an index page can hold up to nine options.

Document pages are the basic content pages. A document page is most often a combination of text and graphic information. If more information exists than can be placed upon one document page, additional pages can continue the document, accessed by advancing via a "next" key on the keypad. As a rule of thumb, document pages should end with a complete sentence.

Action pages allow for user interaction with the host terminal. Usual kinds of interaction include teleshopping and games. Educational uses of action pages might include testing, messages, calculation based problems, and simulations, and CAI.

Gateway pages provide access into alternative data bases.

For the beginning programmer, the use of index and document pages should be mastered first, then action pages.

Objective #3: Describe the Telidon grid.

Prior to any discussion of writing guidelines and techniques, it must be noted here that text input and layout for Telidon pages are formatted according to a text grid (grid 4 on Norpak IPS terminals). This grid, consisting of 40 rectangular units horizontally and 20 such units vertically, corresponds to Telidon 'Text 1, single height'. Each rectangular unit in the grid measure 7 pixels high by 5 pixels wide and will contain a single alpha or numeric character of the T1-TS format. Thus, one could hypothetically type in a total of 800 alpha and/or numeric characters, using T1 - TS, on a single Telidon page. Since the total area allotted to each character (and each single space between single characters or groups of characters) in any of the given Telidon text fonts or heights are fonts or heights are equal, visual spacing - common in the print medium - does not automatically occur. Therefore, an 'i' is allotted the same total space as an 'm' or an 'o'; this contributes to the blocky appearance of even the smallest Telidon text characters when viewed in a body of text. Visual spacing may only be accomplished at present via manual manipulation of characters - that is, each individual character being created as a separate 'text string' and then positioned accordingly. However, this technique should be avoided as it causes a much slower rate of display and also uses up more money.

In general, when writing for Telidon pages, work within a 38 by 18 grid, leaving some blank space around the edges of the page. The reasons for this are as follows:

1. Pages overloaded with information are very difficult to read. Overcrowding causes eye strain and fatigue, rendering the copy less readable and thereby altering the user's comprehension of the material- probably for the worse. Text that is visually allowed some 'breathing space' on a page not only looks better but is easier to read.
2. Home T.V. sets may often cause a slight distortion of videotex page content. For example, an overscan may result in text being 'pulled' off the screen in the upper right hand corner of the page.
3. A white flashing X in the lower left hand corner of a page usually indicates a transmission error. Such errors can be caused by text that is input outside of the grid boundaries during the initial page creation phase. A flashing X is distracting and the 'out-of-bounds' text character(s) may get arbitrarily moved around the page in various undesired locations each time the page is requested.

As mentioned, the text grid serves as a handy guide for text layout and inputting and should be used as an aid to both copywriters and page creators. The grid will not be stored when page content is stored. Other grids can be used for larger text sizes and graphic layouts and some grids may even be defined by the IPS user.

TELIDON GRID FOR GRAPHIC CREATION

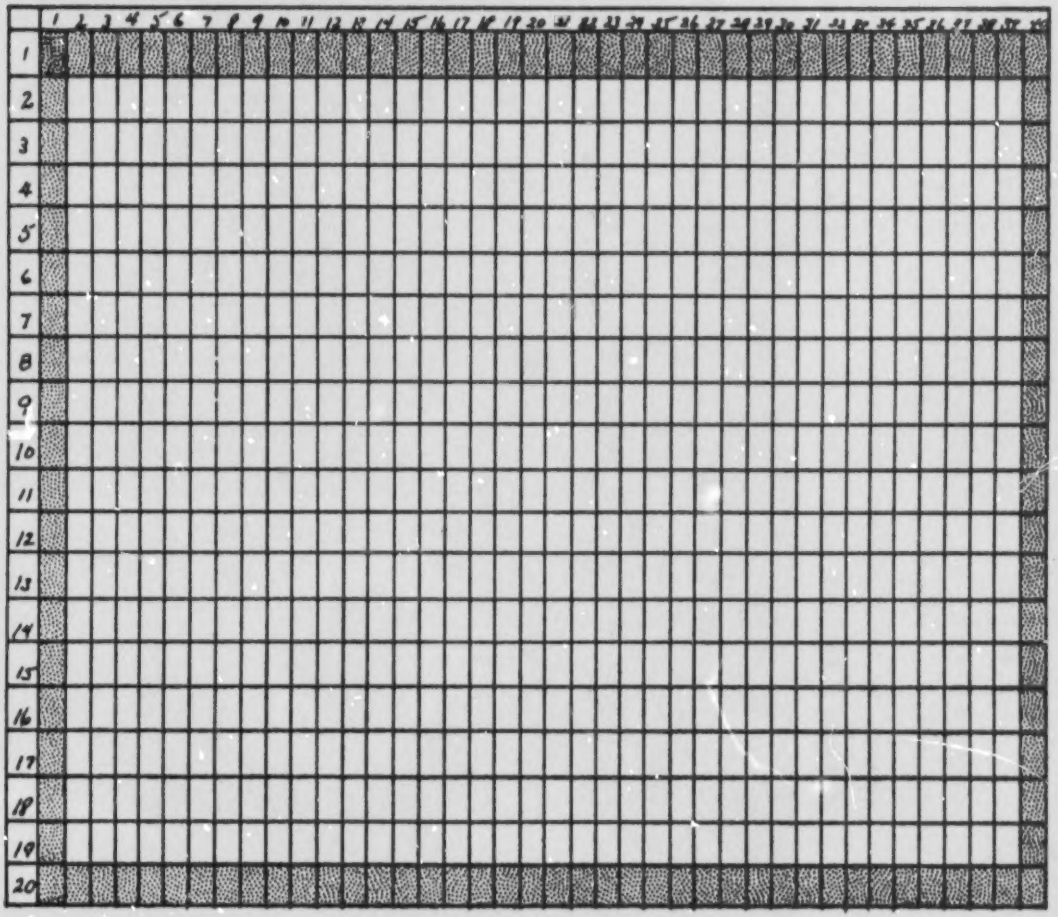


Figure 3

Objective #4: List and discuss seven steps in copy-writing and text layout.

What follows in an analysis of text page components plus some suggestions as to how copy-writing and text layout can be approached in order to create effective and easy to read pages. For the time being, we will assume that copy is to be written and arranged for a single Telidon page; the issue of routing (linking one page to another so that the user can move through a package of information or an entire data base) will be discussed more fully later. Once the coypwriting principles for the content expert and/or instructional developer have been outlined, a short exercise will be given involving writing and laying out text for a Telidon page.

1. The first step in copywriting involves gathering together all the raw data from which the page content will be taken. All extraneous or non-essential information can be crossed out since the small size of the T.V. screen and the text fonts currently available greatly limit the amount of information (number of words) that can be put on a single page.
2. Next, divide the page content further into the following basic components: title, text, graphics (optional); additional information such as the Information Provider's (IP) name, a page name or number and routing instructions. The title, text, routing instructions and possibly the graphic can be considered of primary importance; IP name, page name/number (if displayable) and a purely decorative graphic can fall into the category of material of secondary importance. Generally speaking, the title, text and a graphic of primary importance occupy the most prominent or

'central' area of a page, while IP name, page name/number and routing are often relegated to the peripheral areas of a page.

3. A title should reflect or summarize the page's content clearly and concisely. Avoid long-winded titles. Make sure that every page carries a title; this not only helps to reinforce the user's selection in his/her own mind, but also acts as the key page identifier of any given page requested on a computer system which does not offer automatic page name/number display. As a title 'announces' the page's content, it is logical to have it located at the top of the page, often in a centered position. If using the Telidon text grid for Tl-Ts text entry, consider avoiding the top row of the grid (better for perhipheral information) and instead consider row 2, 3 or 4 for the title placement.

4. The textual content of the page is your message and should be a clear, concise statement of what you wish to say. As a rule of thumb, try to limit the total word count to a maximum of 75 to 80; as previously stated, too many words will most likely cause eye fatigue and hamper content comprehension. Videotex is not, in its current form, suitable for long passages of 'flowery' language. Keep the copy brief, direct and terse. Eliminate extraneous or redundant words; use action verbs, imperatives and experiment with abbreviations. Once a style is adopted, make sure it is used throughout a series of pages that are to be related; for example, if an ampersand (&) is going to be used in place of 'and', ensure that all pages in a given 'information package', application or database adhere to the stylistic rule. In addition to abbreviations, reduced punctuation can help maximize the space available for the actual copy; employ abbreviated forms and omit punctuation only if the meaning of the content will not be obscured in any way.

The language style should reflect the overall tone of the application and have a direct appeal to the target users. For instance, an educational word quiz for 8 year olds will read very differently from a grade 12 chemistry course.

Lastly, text must consist of accurate and correct information. Content that is to be regularly updated must be submitted on time; out-of-date content will not be read by users and reflects poorly on the Information Provider or program sponsor and, also, the system operator.

Text layout is often dependent on several factors, such as whether or not there is a graphic to accompany the text and how much space the graphic will occupy, the total number of words on the page, whether standard paragraph and sentence structure will be followed and also the prevailing 'house style' of the page creation company or preferred style of an individual designer. For pages that consist solely of text, the following layout guide may be helpful:

In general, skip one line after the title before beginning the text. Left-hand margins for all paragraphs should be justified; right-hand margins can be left unjustified (ragged). If possible, leave one line blank between paragraphs, as this may help to ease eyestrain if the page contains a lot of text. Consider indenting the first word of each new paragraph by one character; if this format is adopted, be consistent throughout an entire application of related pages. Leave one blank space after both periods and commas. Don't run your copy too close to the bottom of the page as some space will be needed for routing instructions. And, when using the TI-TS text grid, it is advisable to always leave the first and last vertical columns of the grid (on the far left and far right) blank; this aids in preventing an overcrowded appearance on a page and reduces the

chance of content being lost along the sides of the page on home television screens that tend to overscan.

5. Graphics provide visual support and/or enhancement of written copy. Graphics are sometimes used to brighten a page and capture the viewer's interest, or they may help to clarify information presented elsewhere. Some graphics can successfully replace text, as in the case of pie charts and bar graphs which illustrate so simply and effectively what might take many paragraphs or columns of figures to explain. Some pages may not require a graphic. When planning page content, ask yourself what specific contribution the graphic will make to a page. Remember that a graphic should relate to the subject material if page unity is not to be lost. Avoid graphics that are too elaborate and take too long to display once they have been created. A graphic in a 'live database' should ideally take 15 seconds maximum to display; otherwise the user group will soon tire of watching a slow display of an image once the initial newness and novelty factor has worn off.

   Placement of graphics on a page is dependent upon the presence/absence and amount of text plus the overall proposed size of the graphic and its complexity. When considering page layout, approximate how much area you feel the graphic will or should occupy; consultation with a skilled designer/page creator prior to the page creation process will clarify how much space is actually needed.

6. Routing instructions are extremely important and must appear on each page. A user must never be left stranded on a page with no clear indication of where he/she can move to next. Instructions should be clear and concise; the copy should, wherever possible, be an exact duplicate of the title of the page that is being pointed (routed) to. The text used in the routing instructions must be preceeded by either an alpha

or numeric character (remember that alpha will only work if the users have access to an alphanumeric keypad or keyboard) or a page pointer (example: forward arrow or 'next' page indicator > ; up arrow ^ ; etc.). Routing generally follows a pattern in determining the order of routing instructions. A good guide to follow is outlined here: the first routing choice should logically point to the page that will most likely be accessed after the present page is looked at; this could be a page that continues the content of the current page or it might be another page in the application containing closely related or complementary information. The second routing choice points to a more distant page; this could be a cross-reference to another area of content in the application or it could lead the user back to a main index or menu page. It is wise to plan page content so that there is sufficient room for at least two routing choices. This allows the viewer more freedom to choose what he/she would like to see, and in a sense offers users the illusion of 'free movement' in a database.

Main index or so-called menu pages generally carry little explanatory copy and are concerned mainly with introducing the application (through a prominent title and often a graphic) and listing all of the main areas of content that the user may choose from. Therefore, there is room for many more routing choices. Individual menu selections may be listed in descending order of importance; more popular or newer choices may be positioned at the top of the list. Be sure to check with the system operator on whose software the database will be running - the original Telidon software offered nine possible routing choices but newer software programs provide for up to twenty-five.

Text pages, often referred to as content pages, usually carry their routing instructions at the bottom of the page,

following the text and or graphics, and often centred on the page. When working on page layout, try to always keep the bottom two or three horizontal lines of the text grid available for routing.

7. Lastly, the positioning of the Information Provider (IP) name and page number/name must be addressed. The IP name, which must appear on every Telidon page according to industry regulations, is often located in the uppermost left-hand corner of the text grid.

The page name/number is not obligatory information and, indeed, is now often not automatically displayed on the screen when a page is requested. Whether this information is auto-generated by software or is entered manually on an IPS terminal during the page creation phase, it usually appears in the upper right-hand corner area of the page.

All of the page components examined here play a significant role in the creation of Telidon pages. The order of display of these elements will be elaborated upon in the section dealing with page design principles.

It must here be noted that there is some controversy over the marrying of text and graphics on a single videotex page. In addition, experimentation is being done with the overall spacing and placement of information. Some research is being carried out on the effect on human concentration and eye movements of having graphics display on a screen while the accompanying text is being read. There is some concern that people's attention span may somehow be upset and their comprehension of data disrupted by the distraction of certain graphics which appear on the T.V. screen after the text has been displayed.[1] Since videotex is still such a new medium and because there is still much "user response" research to be done and analyzed, it is difficult to come up with time-proven, hard and fast

rules for the creation of effective, easily readable pages. During this experimental stage, educators - in conjunction with graphic artists - may well wish to experiment with various types of layout styles in various instructional applications. Statistics listing the number of "page hits" received by each page are sometimes available from either the system operator or the owner of the database. and will clearly indicate which packages of information are most widely read. Written questionnaires distributed to users may also help indicate which pages attract and hold users' interest - not only in the short-term but also the long-term.

[1]Dr. K. G. O'Bryan, Ph.D. (Toronto) has been extensively involved in eye movement research over a number of years. His initial work, focused on printed material and on television; recently he has begun consulting the field videotex with page creation houses and information providers.

Objective #5: Summarize seven basic Telidon page design principles.

Basic Telidon Page Design Principles

We have now covered the basic components of a Telidon page and examined copy-writing. We turn next to examine a few basic page design principles. It is very useful for an educator to be familiar with certain design features when meeting with the graphic artist to discuss layout details. At such a meeting, the copy-writer should produce all grid sheets containing entry-ready copy (checked, of course, for correct spelling and grammar), a routing diagram indicating how pages relate and route for one another plus any visual reference material which will aid the artist. Each grid sheet must contain the page name/number, file name and specific routing choices followed by the page numbers of the pages that the choices route to. Such information must be clearly marked.

Many artists design directly on the Telidon screen (using cursor movement keys) or the tablette, while others prefer to do thumbnail sketches, detailed layouts or storyboards of the entire application. Ideally artist and content writer work together as a team, determining some basic design features that will both enhance the information and serve to visually unite one page to the next. Graphic and overall design guidelines/instructions may be indicated right on the grid sheet - or may be covered in a storyboard presentation or all purpose design guide outlined on paper.

Design principles that will be discussed here are:
use of text varieties, borders, colour, highlighting, the blink function, order of display and texture overlays.

1. Text sizes, fonts and cases have a strong impact on how information stands out and is read on a page. In general, upper and lower case is considered easier to read than upper case only. Upper case can be used sparingly (for instance, titles and subheadings) but avoid it for large bodies of text. Some of the larger text sizes (T2, T3 and T4) can be experimented with for page titles.

   If special fonts are to be designed by graphic artists for use on main index pages, remember to select simple shapes that are easy to read. Sans serif fonts often work best in videotex. Be sure to also keep in mind a quick rate display.

2. Borders can help to frame information on a page and unify pages within a given application. They should also be quick to display and not too elaborate, sometimes borders incorporate a logo. Skillful use of borders can help to focus the eye on the most important page content by separating and 'pushing' peripheral information to the outer most areas of a page. For example, a simple single line used to separate the IP name and page number from the main content, and perhaps the same line repeated at the bottom of the page to offset routing instruction from the text can do much to draw attention to the title and main information. The IP name, page number and routing, although clearly visible, are simply not highlighted and are relegated instead to a more secondary function. Avoid using borders or single dividing lines throughout copy; this actually impedes the eye's free movement down the page and may accomplish the exact opposite of highlighting information. Effective spacing and highlighting with colour are probably better for focusing attention.

3. Colour is often misused on videotex text pages, resulting in pages that range from illegible to visually boring or too 'busy'. While the copy-writer and content provider are not expected to be well-versed in colour theory, a few basic explanations and guidelines should certainly prove helpful.

Colour luminosity is determined by the amount of light transmitted via the red, green and blue (RGB) guns. Colour luminosity currently available for Telidon page creation (in descending order of brightness) is as follows:

white - 100%
yellow - 89%
cyan - 70%
green - 59%
purple - 41%
red - 30%
blue - 11%
black - 0%

The first four colours (plus grey 4, 5 and 6) work well for text; purple, red and blue should be avoided for text; black can sometimes work for <u>small</u> amounts of copy presented on a light background, and it also may be used effectively as a drop shadow for lighter colours of text. Large amounts of text are most readable when presented against a black or very dark grey background. It has also been shown that large bodies of text executed in colours of the highest luminosity (white, yellow) are too bright and result in eye fatigue. Avoid combining too many different colours on a single page; three should be the maximum. Try to choose colours that complement one another and that are similar in their luminosity.

4. Highlighting information on Telidon pages is very simple. As previously mentioned, careful spacing can draw attention to pertinent data. The highlighting of individual words or numbers within sentences or paragraphs can be accomplished through the introduction of a different colour. Titles are often set apart from the body of text by a colour change, and routing pointers and numbers are emphasized and differentiated from the actual textual routing instructions via colour highlighting.

   Conversely, the selection of a lower luminosity color will help downplay secondary or peripheral information. As mentioned above, upper case is sometimes used to emphasize certain words or short phrases - but please use sparingly.

5. We recommend the blink function, although sometimes used by page creators to highlight content, should be avoided entirely. Any object, character or text string that continually flashes off and on is very distracting to the viewer and will most likely cause eye fatigue, disrupt eye movement, and thereby impede easy reading and possibly comprehension of the material being presented.

6. The order of display of Telidon page components can be manipulated using the REORDER function. A general rule of thumb for the order of display is firstly, the border should appear, followed by the IP name, page name/number (if desplayable), title, routing instructions and main text/graphic content. Graphics should display last on the page so that the user has the option of reading the copy or selecting a routing option and moving on to a different page without being forced to watch the entire graphic appear.

7. Texture overlays, like complex polygons, slow down the rate of display of Telidon pages, and many of the more subtle overlays are lost completely on home television screens. Also, the new 709 Telidon standards (to be released soon) will alter or eliminate many of the current textures now available. In order to play it safe and be assured of compatable pages, we recommend staying with the basic colour palette (without overlays) for all graphics or keep texture overlays to a minimum.

To summarize, these design principles, should appear consistent from one page to the next in any instructional application. A sense of harmony and balance on individual pages plus overall continuity as the user moves throughout the information package is a desirable target to be aimed at.

EXERCISE: Write a Telidon page.

Now that you have been introduced to basic page components and suggested positioning on the page, as well as guidelines for writing copy, you may wish to practice writing and laying out a sample page. On the following page, you will find a representation of the 40 x 20 Telidon text grid; this can be used for actual copying and text positioning. This grid sheet is a sample that can be used for the preparation of entry ready copy, which will, in turn be forwarded to page creators for graphics creation and inputting.

Prepare the information listed below according to the principles discussed so far. Keep in mind that the text which follows is to appear on a content page (not a routing or index page), is to be accompanied by a graphic (which we shall not ask you to draw, since that is the usual task of the graphic artist), and that a title, Information Provider (IP) name, and routing information must appear along with the body of text.

The content is as follows:

> ROBIN. Our largest thrush, with a red breast. Length 8½-10½". When excited flits tail and flicks wings. Dark grey back, darker head. Voice: lively cheer-up, cheerily cheerup, cheerily cheerily; when scolding wheep-wheep. Prefers lawns, gardens, farmlands throughout Canada and US. Breeds in Florida and Louisiana, winters in southern US.

Use the following page for your version. Our suggested solutions (we have three) will follow immediately coupled by explanations of why we proceeded as we did.

TELIDON GRID FOR GRAPHIC CREATION

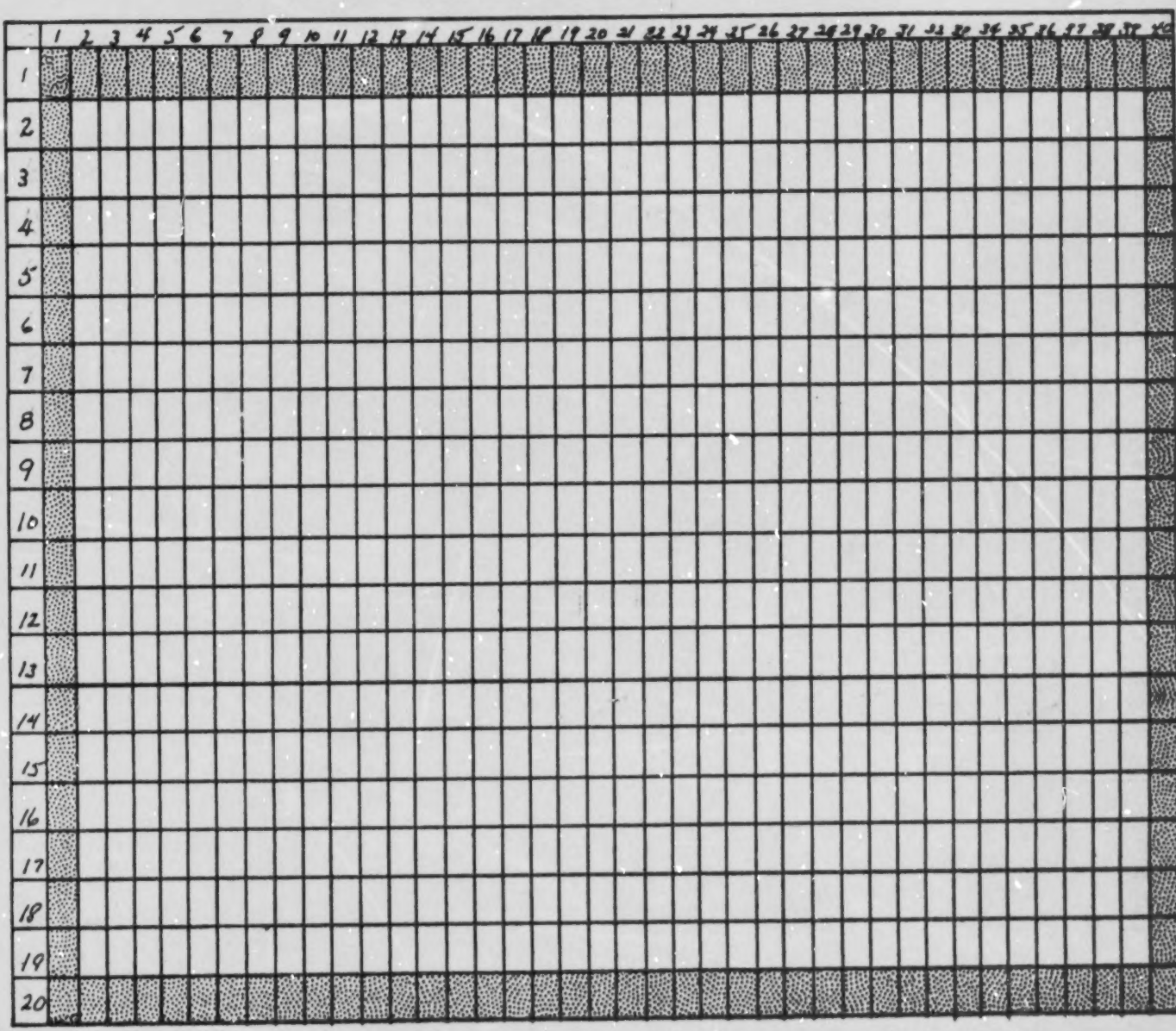
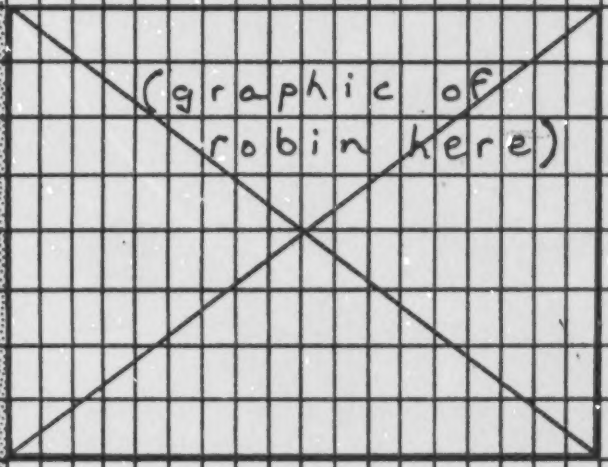


Figure 4

TELIDON GRID FOR GRAPHIC CREATION

IP name page number

ROBIN



Description: our largest thrush; has red brest, dark grey back, darker head; length is 8 1/2 – 10 1/2 in. When exited, flits tail and flicks wings. Voice: lively cheer-up, cheeri cheerily cheer-up; makes a wheep-wheep sound when scolding.

Press 1 Robin, cont.
2 Birds of Canada index

TELIDON GRID FOR GRAPHIC CREATION

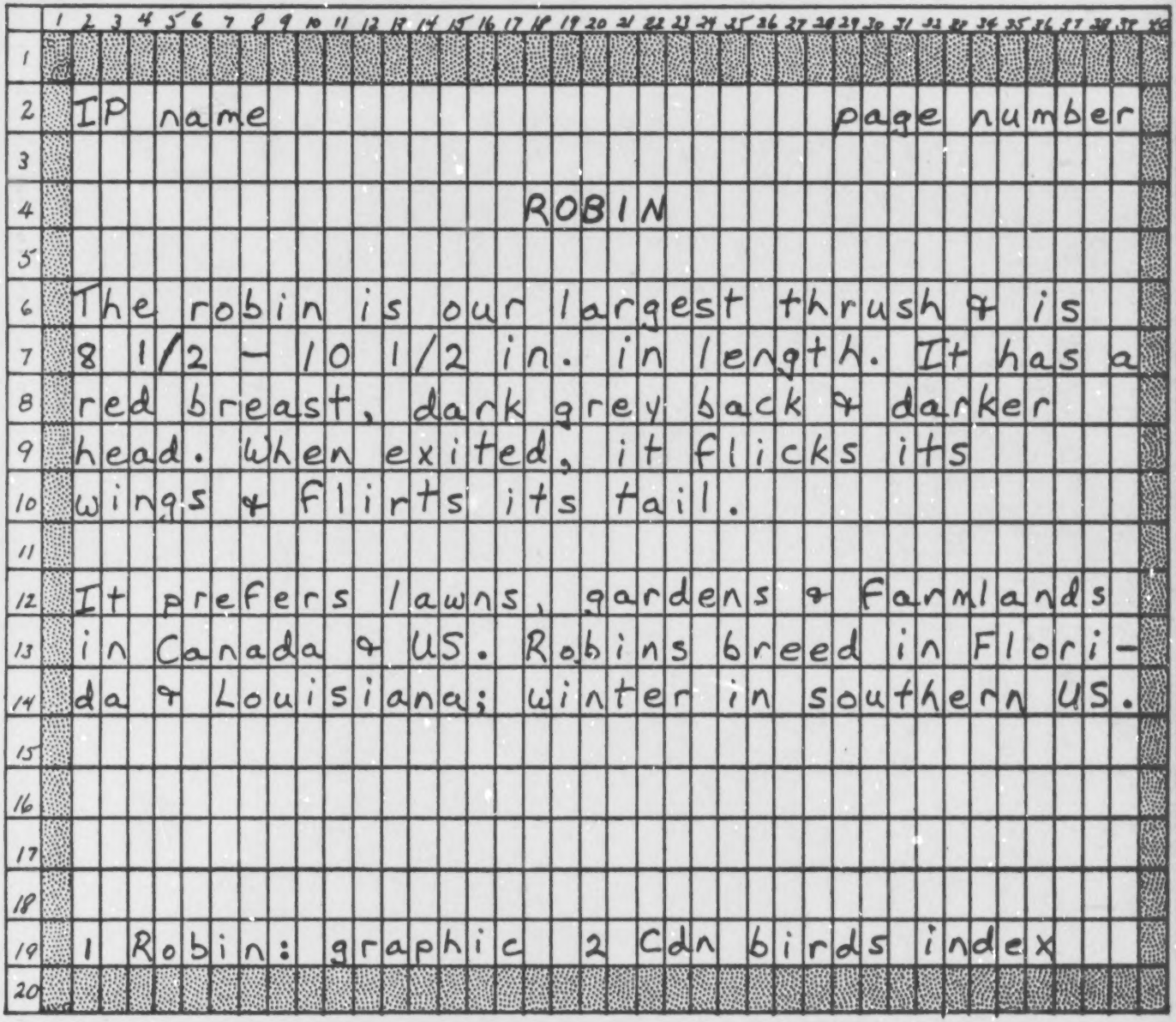

IP name
page number
ROBIN
The robin is our largest thrush & is
8 1/2 – 10 1/2 in. in length. It has a
red breast, dark grey back & darker
head. When exited, it flicks its
wings & flirts its tail.
It prefers lawns, gardens & farmlands
in Canada & US. Robins breed in Flori-
da & Louisiana; winter in southern US.
1 Robin: graphic 2 Cdn birds index

Figure 6

TELIDON GRID FOR GRAPHIC CREATION

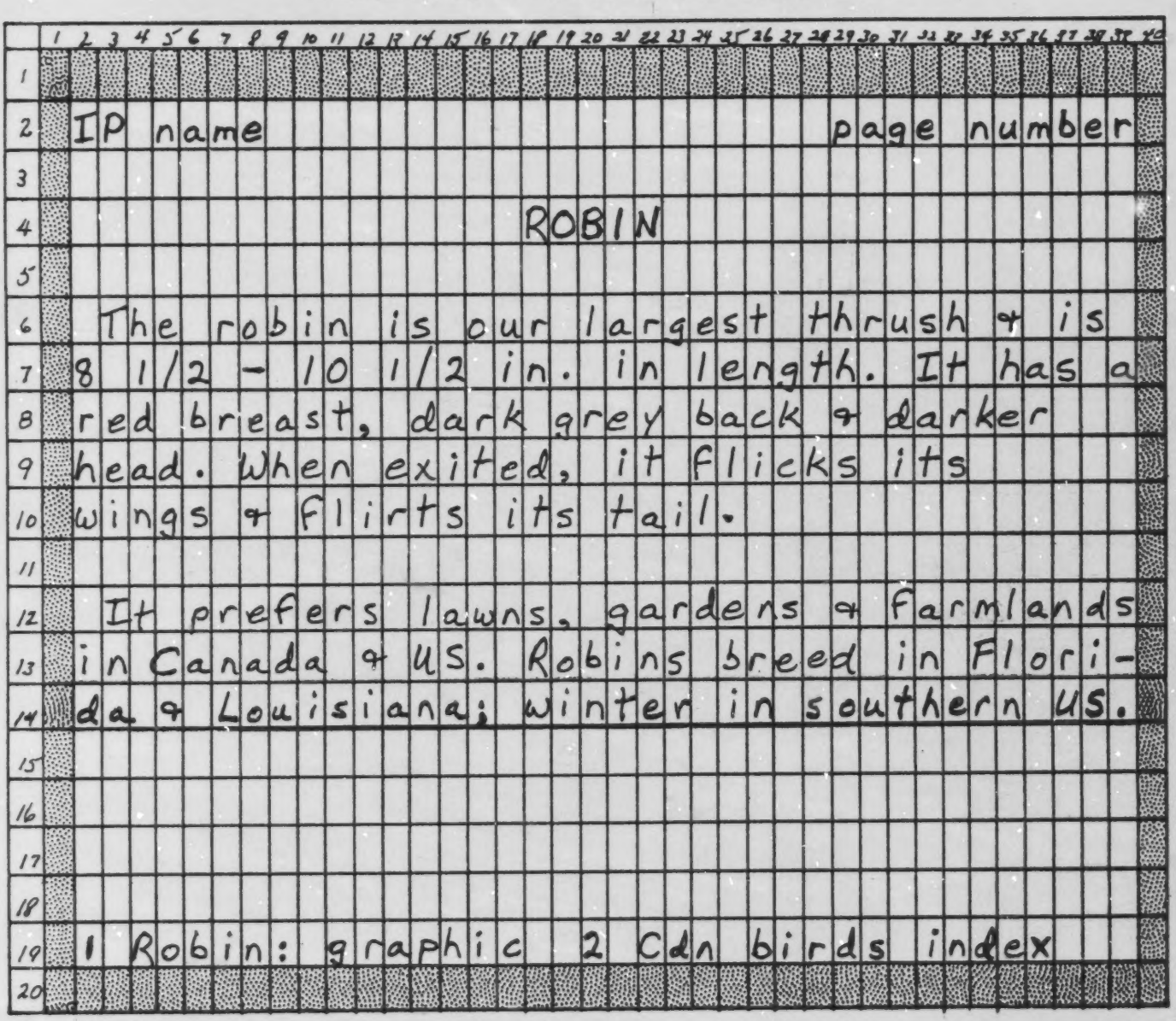

IP name
page number
ROBIN
The robin is our largest thrush & is
8 1/2 - 10 1/2 in. in length. It has a
red breast, dark grey back & darker
head. When exited, it flicks its
wings & flirts its tail.
It prefers lawns, gardens & farmlands
in Canada & US. Robins breed in Flori-
da & Louisiana; winter in southern US.
1 Robin: graphic 2 Cdn birds index

Figure 7

Feedback:

In figure 5, we decided to incorporate both text and graphic on the same page. The position of the IP name, page number and title can be clearly seen, as well as the routing instructions at the bottom of the page. As we were unable to get all of the copy onto the first page, our first routing choice clearly indicates that more information on the robin is available. This additional page that is being pointed at should be titled "Robin, cont" and will, of course, deal with the robin's preferred habitat and breeding areas. The second routing choice allows the user to move back to the main index and make another selection.

With figure 6, we chose to exclude the graphic from the initial page, offering only text. All left margins of the copy were justified and spaces were left between each paragraph to provide greater ease in reading. Note that the ampersand was used consistently throughout the copy and that a period was used after the abbreviation for inches in the first paragraph; this is to clearly differentiate it from the following word, "in". To help conserve space, periods were omitted in the abbreviation for the United States; use of all caps should keep "US" from being confused with the word "us". The abbreviation "Cdn" is also used in place of Canadian.

By placing the graphic (which now has room to be expanded to a full page) on a separate page, the user is not forced to watch the graphic display and has the option to look at it or not.

Figure 7 is basically identical to the preceding grid sheet, with the exception that the first word of each paragraph has been indented one character space. This is purely a stylistic factor, used to reinforce an ease of reading and, hopefully, comprehension.

As you can see on all three grid sheets, each page contains a completed statement or series of completed thoughts. Always avoid breaking up a main thought at the end of a page or breaking up text mid-sentence. This tends to reinforce the complete unity of a page and will not leave the user dangling mid-stream or feeling forced to view another page in order to complete a thought or finish a sentence.

WRITING FOR TELIDON: PROGRAMS

FOUR: WRITING FOR TELIDON: PROGRAMS

The previous chapter examined the basic elements of page creation for Telidon. We are ready now to examine the broader perspective of program development. This final chapter will begin with a consideration of the team approach to instructional development. Then, a model of instructional development will be presented to serve as a framework for Telidon program creation. Finally, a detailed series of design tasks will be presented so that the teacher may systematically proceed in developing a specific program for Telidon. Accompanying these design tasks a case study will be used to illustrate the process.

The Instructional Development Team

The development of instruction at the teacher/classroom level is most often an individual effort. The teacher, given a curriculum guide, is totally responsible for setting specific objectives, developing a lesson plan, selecting appropriate media, presenting the lesson, and evaluating both student progress and the success of the lesson itself.

Telidon is different. Like any of the mass media, the development of instructional material for Telidon is most likely to be a team effort. Sometimes, as at the British Open University, the team structure is rigorous and systematic. Most often a less structured ad hoc arrangement exists.

At the Manitoba Department of Education, the latter approach is most appropriate, and the one in which you will function. At the basic level a three person team will consist of the following: First, a content expert, generally the classroom teacher, is required to select and present the content. Second, an instructional developer will work with the teacher in developing the materials consistent with the Telidon demands and potential. Third, there is a page creator. This individual is most often a graphic artist with some computer experience, or at least some Telidon writing experience.

Is such a team necessary? It depends. Certainly it is not likely to find one individual with all talents rolled into one. How about you? In a given topic, do you have the content expertise such that you can select, sequence, explain, and present appropriately to your target audience?

As an instructional developer, do you know how to write discrimination frames, BABOON frames, and remedial frames? Do you know when to present content and when to ask questions? Can you structure linear and branched programs?

As a page creator, do you have a basic understanding of videotex design techniques? Do you understand the limitations of the Telidon grid? Can you input data via an IPS terminal? Do you know which color combinations are right and which are wrong?

Probably you are able to answer "yes" to one of these categories, but not to all three. This is precisely what the team approach is all about--the ability to combine the special strengths of several people together to form one strong unit.

Instructional Development

Instructional development is a systematic information process for analyzing instructional problems in order to develop tested, validated, and feasible solutions and products. It is generally acknowledged that the computer assisted instruction movement will make or break itself on quality instructional products. It has been demonstrated time and time again that the technology, that is the hardware, is already in place to do nearly anything we demand of it. What we need is good quality instruction which will justify the time and expense of the medium involved.

Unfortunately, past practice shows that this is easier said than done. Instructional sound films, for example, have existed since 1927, and indeed the film medium has clearly developed its own "classics." And yet, there is no doubt that film has failed to have had significant impact on the instructional situation. Teachers still prefer to teach without film. The same may be said of television, programmed instruction, and, in fact, the entire "audio-visual" domain.

The question becomes inevitable. Will CAI and Telidon-based instruction follow the same road of earlier instructional technologies? Common sense tells us "yes."

And yet, perhaps this time educators are ready. The difference is theory-based systematic instructional development. The crux of the problem lies in the instructional materials themselves. These must be of top instructional quality; they must be of top technical quality; and they must use the medium uniquely.

This latter point may well be the most significant. If <u>any</u> medium can be substituted for any other; if there is no <u>unique</u> contribution inherent in the chosen medium, then economic and logistic factors will predominate as key elements in media selection.

THE INSTRUCTIONAL DEVELOPMENT SYSTEM

DEFINE	Function 1 IDENTIFY PROBLEM - Assess Needs - Establish Priorities - State Problem	Function 2 ANALYZE SETTING - Audience - Conditions - Relevant Resources	Function 3 ORGANIZE MANAGEMENT - Tasks - Responsibilities - Timelines
DEVELOP	Function 4 IDENTIFY OBJECTIVES - Terminal - Enabling	Function 5 SPECIFY METHODS - Learning - Instruction - Media	Function 6 CONSTRUCT PROTOTYPES - Instructional Materials - Evaluation Materials
EVALUATE	Function 7 TEST PROTOTYPES - Conduct Tryouts - Collect Evaluation Data	Function 8 ANALYZE RESULTS - Objectives - Methods - Evaluation Techniques	Function 9 IMPLEMENT/RECYCLE - Review - Decide - Act

Figure 8

Typically, the design of CAI adopts an approach not reflected by the now widely accepted instructional development models such as those developed by the Instructional Development Institute (See figure 8), Gagne and Briggs, or Ivor Davies. Such models direct the educator to undertake a process of data gathering, problem definition, and objective setting before selecting the medium to be used. By contrast the CAI designer tends to start with the medium and then progress to design through a technique often called "authoring."

We believe that so called "authoring" techniques have far different implications than "instructional development" (ID) as we use the terms. In particular, instructional development procedures are characterized by four major factors. First, instructional development uses a systematic model. While specific models vary greatly based upon specific conditions, all ID models are characterized by a define-develop-evaluate paradigm. Second, instructional design procedures emphasize a team approach to the development of instruction. Third, instructional design focuses upon problem definition first, media selection after (unlike the traditional approach in which media selection precedes needs.) If you have ever asked "I wonder if there are any films on this topic?", you have fallen into the "media selection" first syndrome. Fourth, instructional development demands product evaluation and learning validation. It is not enough to develop an instructional product; it is necessary to provide evidence that it does what it was supposed to do.

Models of instructional development range from the very simple to massively complex models of 20-30 or more discrete steps. For our purposes, we shall present a simple model which contains the basic elements of all ID models. Its four elements are:

Define
Design
Develop
Evaluate

The define stage is the first requirement of systematic ID. Here, the problem is identified, data from the existing instructional setting is thoroughly analyzed, the instructional development team is organized.

The design stage requires the team to design an on-paper prototype of the proposed product. The key to this stage is careful selection of appropriate content, statements of behavioral objectives, and development of product treatment or storyboard.

The development stage is the stage during which a first draft product is put together ready for tryout.

The evaluation stage requires that the product be tried out on actual audiences. Three standard formative evaluation activities are:

*individual student validation. In this technique, the designer observes an individual student work through the program. The individual may be a content expert, or a target audience member.

*small group trial. Here, a typical target population group of 15-25 students work through the program.

*large group field trial. This methodology focuses upon actual use of the product "in the field" before the final dissemination stage takes place.

What follows is an expansion of the design-develop-evaluate paradigm into a series of specific "design tasks" prepared with the Telidon production activity in mind. Accompanying each design task is a case study example. The design tasks to be discussed are:

DEFINE:

Design Task #1: Select the content you wish to teach.

Design Task #2: Determine how Telidon materials will be used within the overall instructional system, and which of the critical functions of instruction will be met.

Design Task #3: Analyze the feasibility of your proposed product.

DESIGN:

Design Task #4: Write the behavioral objectives for the proposed product.

Design Task #5: Storyboard your product.

DEVELOP:

Design Task #6: Write the pages.

EVALUATE:

Design Task #7: Conduct formative evaluation activities.

We shall now examine each of these design tasks in some detail.

Design Task #1: Select the content you wish to teach.

The first step in the design of instruction involves identification of the proposed subject area, and the specific content to be examined. There are two aspects to this step which must be followed. First, the content should be clearly stated. Second, a justification or rationale should be made for the content selection.

Some writers add a working project title, simply for ease of referring to the project during its progress from definition stage through to final development.

CASE: In order to complete the entire development process in a practical way, we shall present a case study which will take one example, and carry it through each of the design tasks presented.

a. Proposed content: The historical, sociological, and aesthetic analysis of the Easter egg.
b. Working title: The Ukrainian Easter Egg.
c. Rationale: Multicultural topics are a natural for Canadian education. Non-English, non-French Canadians constitute almost one-third of our population. Multicultural educational materials are few, and not readily available. The specific topic suggested above is of direct value as one component of the Canadian folk arts.

Comment: At this stage we have not provided a rationale for the medium. That is, is Telidon the best way, or even an appropriate way to present the topic? That analysis will be reserved for Design Task #2.

HINT #1: Don't be too ambitious. Select a "chunk" of content which you feel could be presented within a 15 minute period of time.

HINT #2: Consider the potential visualization of your topic. Ask: "Does this topic lend itself to the use of visual material?" While visuals are not a necessity within a videotex system, nevertheless the potential of graphic and dynamic visual features are one of the unique characteristics of Telidon.

CASE: Our example of Ukrainian Easter eggs can be considered in light of the above "HINTS."

First, it may be that our topic is too broad. To attempt to cover "the historical, sociological and aesthetic analysis..." in 15 minutes sounds like too much. That simply means that we will have to revise our topic downwards to a more manageable size. For now we shall leave it as it stands, but at least we are forewarned.

Second, it seems that the topic is quite ameanable to visualization. Indeed, Easter eggs are a visual art, something to be seen, and it would appear that Telidon might be an opportunity to present this content in some interesting aesthetic ways, transcending mere textual information.

Now it's your turn. At this stage, take a clean sheet of paper and begin DESIGN TASK #1. Include the following information.

a. Content area
b. Working title
c. Rationale/justification for content

Remember: Select a portion of content teachable in about 15 minutes, and consider the visualization potential of your topic.

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Design Task #2: Determine how Telidon materials will be used within the overall instructional system; and which of the critical functions of instruction will be met by Telidon.

In considering Telidon as the instructional medium to convey certain content, the team needs to consider first how videotex materials are perceived to integrate into the larger instructional system, and then, which of the critical functions of instruction will be met by the Telidon package.

There are seven possible ways Telidon may integrate into an instructional system:

1. As a total teaching presentation. Telidon may provide the entire package of information, complete and self contained.
2. As a major resource supplemented by other media forms. In this model, the user is instructed via the Telidon system to refer to other media as appropriate...film, text, video, slides, etc.
3. As an adjunct to a traditional course. Here the major emphasis is presented via other media. The purpose of the videotex material is to provide supplementary information, perhaps in encyclopaedic form, for quick drill-and-practice review; for a simulation; or perhaps in some other format.
4. As a preparation or review. In this case, Telidon materials would most likely be presented in quiz format.
5. As a means of linking learners and teachers from different locations. Tied in with teleconferencing techniques, Telidon could provide the messaging function for a distance learning course.
6. For management of instruction. Given on-line memory capability, Telidon could keep records of student progress through a program, as well as student success in tests and exams.
7. For information only, rather than instruction.

In selecting Telidon, the critical functions of any instruction need to be considered. All of the following seven functions must be present somewhere in the total instructional program. If Telidon carries only some, the others must appear via other media. Here are the seven:

1. Gain and maintain the learner's attention.
2. Orient and motivate the learner.
3. Present new information in sequential steps.
4. Require the learner to make responses.
5. Provide feedback to the learner's responses.
6. Allow the learner to proceed at his own rate.
7. Evaluate the learner's achievement.

CASE: Back to our "Ukrainian Easter Egg" program.
Proposed function of the Telidon component: We go for #1 or #7. This package will be developed to be complete in itself. Since we intend to add pre-post tests, and specific teaching objectives, our program would fall into Category #1 rather than #7, that is "total instruction", rather than "information only." (Refer to list on previous page.)
Crucial functions of instruction. Because the program is intended to stand alone, an attempt must be made to incorporate all seven of the critical functions. That is, it will gain and maintain attention; it will motivate; it will present information sequentially; it will require learner response with feedback; it will be self paced; and it will conclude with a self-evaluating quiz.

Your turn again. Identify for your proposed program:

- Proposed functions of the Telidon component within the total instructional system.
- Crucial functions of instruction and how they will be met.

Design Task #3: Summarize the feasibility of your proposed program, and conclude with a go/no-go decision.

The purpose of this task is to examine those parameters which will define and constrain the shape and direction of your development effort. The basic result of this step is to allow your team to arrive at a go/no-go decision in light of all previous stages coupled with this one.

Activities to be undertaken in this design task are

1. Identify the educational need to be met.
2. Define the target audience.
3. Analyze the instructional setting.
4. Estimate time and cost factors.
5. Identify existing relevant resources.
6. Identify any limitations, delimitations, or restrictions.

CASE: The Ukrainian Easter eggs project needs to be examined in light of the above criteria:

1. The need. Stated earlier in Rationale (Task #1). Further statistics show that one local Winnipeg museum last year delivered instruction on this topic to 700 junior high students in 20 schools. Not only was the exercise a strain on the museum resources, but the large number of requests resulted in non-uniform instruction.
2. The target audience. This is a difficult question which needs to be addressed carefully. It is too easy to say "everyone", but the difficulties in delivering a common package to all age and educational levels is horrendous. We shall limit our intended target audience, therefore, to junior high.

3. Instructional setting. We shall assume that students will have access to the program at school on an individual basis.

4. a) Time. We shall estimate 10 hours preparation time for the 15 minute package. In addition we estimate 30 pages to be prepared by the programmer in about 20 hours.

   b) Cost. No direct costs are involved, since this is a pilot project. There will be no fee for services, no page creator costs, nor shall Informart charge us for putting the package up on its data base...this time.

5. Relevant resources: Many person and non-person resources exist which may be called upon to provide support and assistance. A bibliography is available.

6. Limitations: At this point in development, it would seem that Telidon would not be appropriate for the sequence on how to write Easter eggs. Probably print would be more useful during that stage.

   A second limitation is the availability of Telidon terminals. We need to assume such in at least some experimental schools; we would like to assume such to be available in homes.

7. Delimitations. We shall restrict our program to an examination of types of Easter eggs, rather than the broad focus proposed initially.

Now it's your turn. Examine your content in light of the seven factors presented, then determine whether to proceed or not. In our case, the decision is "yes."

Design Task #4: Write a statement of objectives for your product.

If learning is the function of the program, then it is imperative that the student be presented with a clear statement of performance oriented objectives. This section will review the basic procedure for writing objectives, and suggest ways of writing higher level objectives.

First, the reader is referred to any basic book on instructional objectives such as Objectives in Curriculum Design by Ivor K. Davies, published by McGraw Hill (1976).

Second, the simplest approach to write a proper objective is to construct each objective in a sentence containing statements about

a) audience
b) behavior
c) conditions
d) degree.

For example: The grade 7, 8, 9 student will be able to name four types of Easter eggs, after viewing the program, so that he obtains 100% accuracy. (In this example, the audience is the grade 7, 8, 9 student; the behavior is to name; the conditions are "after viewing the program"; and the degree of accuracy expected is 100%.)

The level of learning required in the above example is rather elementary. To assist the reader in preparing higher level objectives, Figure 9 summarizes the six basic levels of cognitive learning of the cognitive domain, together with a list of sample behavioral verbs.

BEHAVIORAL VERBS FOR BLOOM'S TAXONOMY

Evaluation	to evaluate	to select
	to judge	to defend
	to decide	to support
	to choose	to attack
	to assess	to compare
	to contrast	to determine
	to criticize	
Synthesis	combine	compose
	restate	formulate
	summarize	classify
	precis	design
	generalize	organize
Analysis	categorize	detect
	distinguish	separate
	break down	analyze
	identify	discriminate
Application	apply	show
	use	perform
	explain	demonstrate
	develop	infer
		relate
Comprehension	comprehend	understand
	predict	interpolate
	extrapolate	interpret
	translate	illustrate
	explain	
Knowledge	describe	name
	recall	write
	list	identify
	state	underline
	reproduce	label

Figure 9

Design Task #5: Storyboard your product.

This section will present crucial information for the sequencing of pages into programs. We shall discuss in turn

a) The telidon tree structure
b) Keyword access.
c) Linear programming approaches.
d) Branching techniques.
e) Instructional enhancements.

a) The Telidon Tree structure. In order to understand programming techniques for Telidon, you need first to have a grasp of the data storage architecture used by the Telidon system. Videotex information is indexed in a mainframe computer in one of two ways: either a tree branching structure or a keyboard system. Here we shall explain the tree branching structure, common to all videotex systems, and indeed one of the unique characteristics of videotex with significant educational potential. (At the same time, we again must warn the reader that new technological developments may rapidly outdate the tree structure approach.)

Ball (1981) has provided a reasonably clear explanation of this hierarchy system which we shall repeat here. The accompanying figure (10) will provide the necessary visual reference:

> The Telidon data base is a hierarchy tree structure in which each node in the hierarchy may have nine branches (1-9). Any node which has further branches subtending from it is called an index page. Any node which terminates a branch in the hierarchy is called a document page. Document pages may have up to 999 other document pages attached in a linear linked list, but no branches...

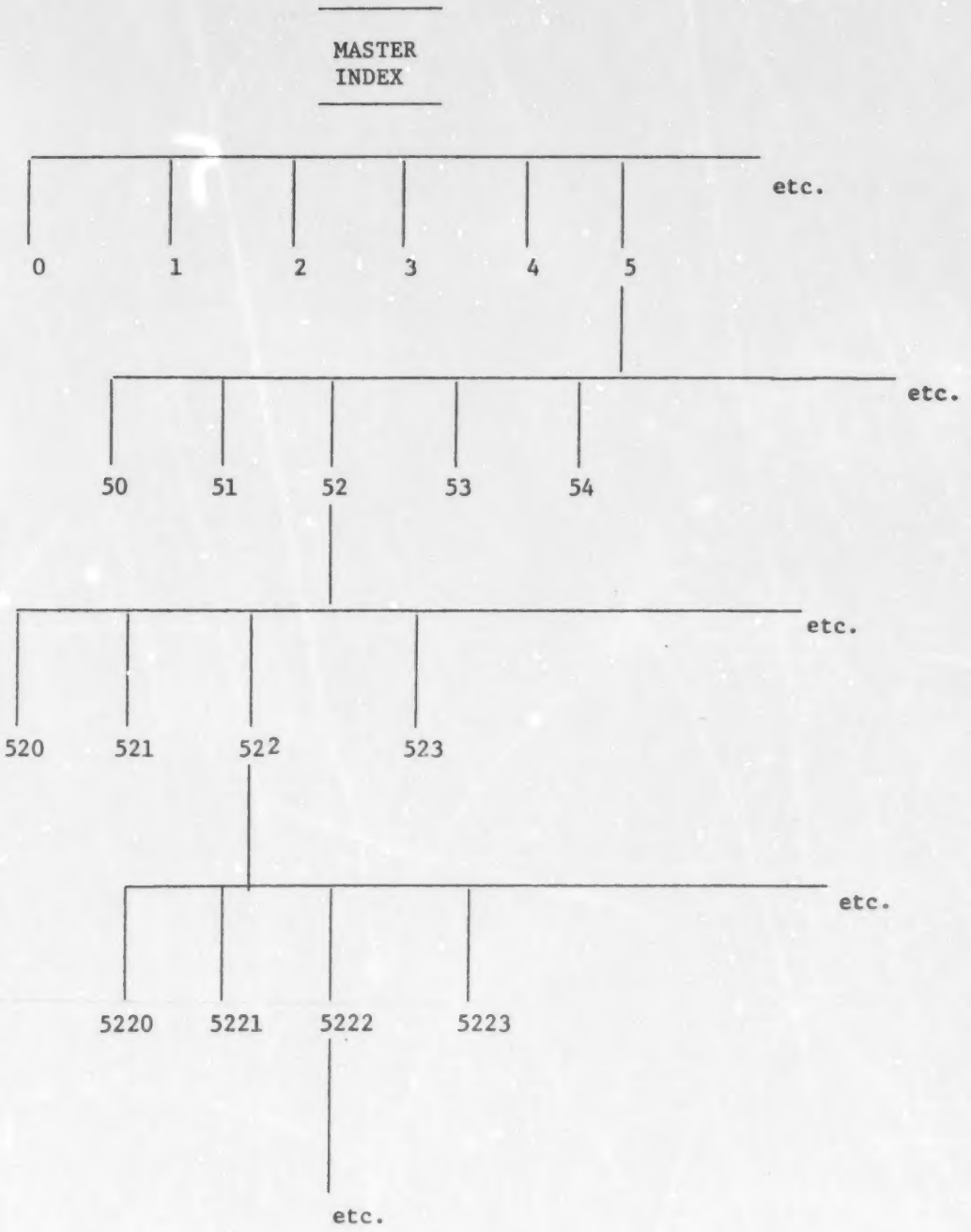

Figure 10 The Pelidon Tree Structure

Each node or page in the index is numbered and the numbers reflect the position of a page in the index tree. For example, page 0.0 is followed by pages 1.0, 2.0, ...9.0; page 1.0 gives rise to pages 11.0, 12.0, ...19.0; page 11.0 to 111.0, 112.0, etc.

Once the tree structure is understood, the Telidon author needs to know the possible "moves" which a user can make while operating the Telidon system. The following symbols on the keypad have been assigned specific operational conventions.

^^ Displays the master index page.

^ Displays page zero of the level immediately above the level presently being displayed.

> Displays the next consecutive document page.

< Displays the immediately preceding document page.

>X Displays the document page which is X pages forward.

<X Displays the document page which is X pages behind.

'' Displays the same page over again.

n.X Displays any page specified by number.

We suggest that you sit down at a terminal with a keypad and experiment with each of the above moves, before writing.

b) Keyword Access. In the keyword approach, the pages look the same as they did before. But now, the user does not need to use numbers, but simply types the appropriate word. (In the Easter egg sequence discussed earlier, if the user types in "pysanky", he will be taken to that frame immediately.)

The keyword approach presents several instructional advantages over the tree branching approach. First, it is simpler to access a given page. Second, a multiple choice question may be constructed which might be answered by a series of single words. Correct responses would become a

keyword for the computer to advance the user to the appropriate page, with appropriate positive feedback. Incorrect responses would route the user to appropriate remedial, review, or explanatory pages.

At this writing, the keyword system is NOT operational using the Telidon Version One software available in Winnipeg. It is expected that Version Two will be available here late in 1982.

Linear Programming Techniques.

We now can examine the same concepts from an instructional perspective. The simplest approach is one known as linear programming, an instructional technique which presents material in a step by step procedure, requiring learner participation, followed by immediate knowledge of results. Figure 11 illustrates a linear progression.

In Telidon, linear programming is often used by sequencing a string of document pages one after the other.

> CASE: In our Easter egg sequence, we could present our material linearly as follows. Page one would list four types of Easter eggs (Pysanky, Drapanky, Krashanky, and Krapanky.) Page two would deal with Pysanky; page three with Drapanky; page four with Krashanky, and page five with Krapanky.) And so the sequence might continue, page by page.

There are several obvious limitations to the type of program described above. First, the progression through the program is linear, that is one-way, and step by step. Second, there is virtually no interaction between the user and the program, other than the fact that the user can select his/her own pace. Third, it follows that this type of program can provide no true individualization of learning. Each learner must progress through the

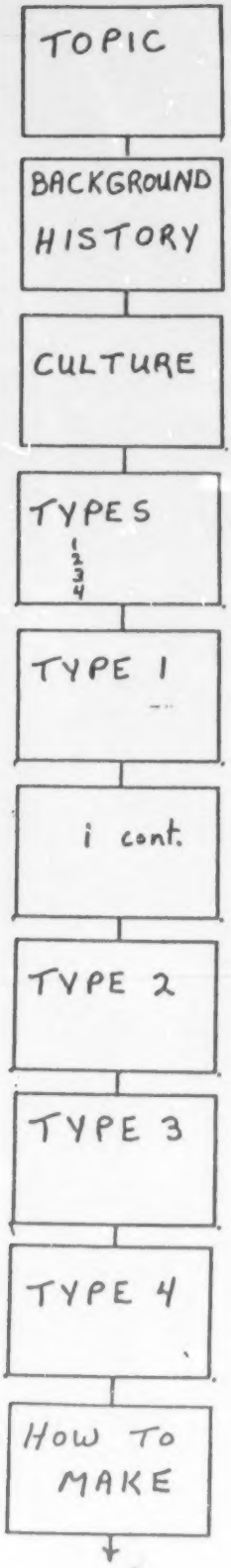

Figure 11

A Linear Sequence

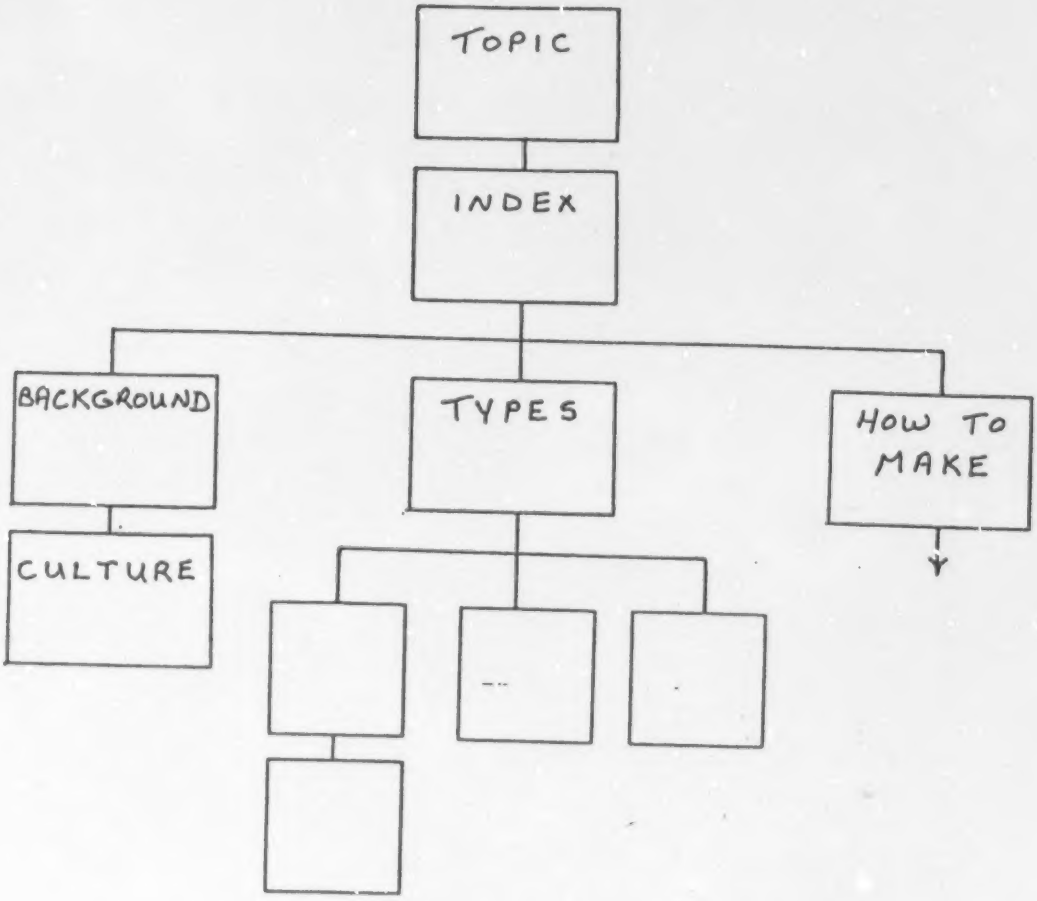

Figure 12

A Branched Sequence

same linear track. Four, the linear program features what many CAI writers derogatorily refer to as "page turning." And finally, one must question what the Telidon program is doing that cannot be done just as effectively by print, or several other media.

However, it should be pointed out, that the above criticisms notwithstanding, a very large majority of current Telidon programs are structured in this linear, page-turning format. We suggest that you learn to recognize the technique, but that you learn as quickly as possible the many alternatives which are possible.

d) Branching Techniques.

A branched program is one in which the user is given a choice, or a series of choices . (In Telidon called a "menu"). Each user response in turn leads to specific additional pages. You probably recognize this as the simple Telidon tree structure discussed earlier.

Fortunately, it is reasonably simple to convert any linear program into a branching program, as our case study illustrates.

CASE: The first page of our Easter egg sequence stated simply that there were four types of Easter eggs, then proceeded to list them. By a simple change, we can turn this page into an index page.

TYPES OF UKRAINIAN EASTER EGGS

1. Pysanky
2. Krashanky
3. Krapanky
4. Drapanky

Press to continue

Figure 13. A Document Page

The preceding document page now becomes:

TYPES OF UKRAINIAN EASTER EGGS

1. Pysanky
2. Krashanky
3. Krapanky
4. Drapanky

Press number for more information

Figure 14. An Index Page

Now, a branch has been set up. If the user pushes #1, he will receive more information on Pysanky; if he pushes #2, he will receive more information on Krashanky, and so on.

e) Instructional enhancements. So far we have suggested three basic approaches to structuring instructional Telidon programs. First we suggest a keyword approach is potentially possible, but not quite available, at least here in Winnipeg. Second, we suggested (but advised against) a simple linear program or page turning model. And third, we have illustrated a branching model.

It remains to highlight several instructional strategies which can take advantage of the tree branching structure in particular. While an informational package often consists of only the presentation of that information, the following list identifies the widely accepted components of an instructional product. We shall examine each briefly.

Statement of behavioral or performance objectives. The purpose of a list of user oriented objectives is to assist the intended user in a) deciding whether he wants/needs to learn the material; and b) structuring his learning through the content. In Telidon, an objectives page may be used to overview the entire program, as a content page, or it may be used to individualize, so that a user may access only those pages which are relevant to the objectives he chooses.

Pretest. One of the best methods of determining which objectives the potential user has already mastered is the pretest. Depending upon the Telidon data base, a computer management system might be able to grade the pretest immediately, and inform the user whether to continue, whether he has already demonstrated mastery, or whether he need concentrate on only a portion of the instructional package.

Posttest. This is an alternative form of the pre test, but occuring at the end of instruction to inform the user and the instructor whether mastery of the material has been achieved. At the simplest level, the post test can be equivalent to the pretest. A quick calculation of pre and post test scores can then give a user an immediate gain score as an indication of his learning.

Instructional activities. These may be content frames, or question-and-answer frames. One rule of thumb in programmed instruction and CAI is that you should never allow more than three frames of information to pass without asking a question. Several types of questions are possible in CAI and many of them are manageable on Telidon as well. In particular, the following questioning styles are particularly appropriate, True/False or Yes/No questions are simple to construct for the teacher, and easy to handle on Telidon data bases. They can utilize a simple loop feedback, where a wrong answer repeats the question. Slightly more sophisticated,

a branch might explain the wrong response (if made), then lead the user back to the main route. Multiple choice questions provide a similar approach, with a series of options providing more flexibility than the simple dichotomy of True/False questions. Well known to programmers is the BABOON frame, a variant of multiple choice, in which the letters BABOON stand for option B, option A, Both, Or Neither.

Design Task #6: Write the pages

Chapter 3 of this manual has focused in some depth on how to write pages for Telidon. You may wish to refer back to those pages as you approach this design task.

Design Task #6: Write the pages

Chapter 3 of this manual has focused in some depth on how to write pages for Telidon. You may wish to refer back to those pages as you approach this design task.

Design Task #7: Evaluate

Specific instructional product evaluation techniques are beyond the scope of this manual. We would refer you to any of the many reference texts dealing with this subject. In particular, Carol Weiss' text Evaluation Research: Methods of Assessing Program Effectiveness, (Prentice Hall, 1972) provides a detailed methodological approach, while Science for the Seventies and Instructional Television: The Final Report, prepared by the College of Education and Division of Broadcasting of the Pensylvania State University (1973) provides an excellent case study.

Once again the reader is reminded that there are three basic kinds of evaluation information to be collected:

a. individual student evaluation
b. small group trials
c. large group field trial.

CONCLUSION

Now it's time for you to start. Perhaps, some final suggestions are in order. First, we think you should begin by looking at existing Telidon pages and programs. Find a terminal, sit down for two or three hours and become familiar with material already available on the various data bases. Look for informational sequences, and look for instructional sequences. Look for the good and for the bad. And see if you can examine CAI materials prepared for microcomputers. These may well appear different than the typical Telidon program, but they will suggest to you the potential of a Telidon system which goes beyond the tree structure data base.

Second, before starting, be sure you know the capabilities of the current system in your area. The people we know tell us that anything is possible; it just takes time and money.

Third, remember that you are experimenting. Try out new ideas.

Finally, when you're finished, try to use your materials on the intended target audience, and evaluate the effectiveness of your program. Remember, your role as a teacher will change, as you begin to integrate new media into the classroom.

And, good luck!

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